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GB 2170091 A EP 0832695 A WO 93/02573 A  
US 5721000 A

(58) Field of Search

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1/08  
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(54) Abstract Title

Coating apparatus for batches of product

(57) Processing apparatus comprises a coating apparatus (30-42) which is adapted to divide a coating material into charges of predetermined size and apply the charges to batches of product 12 at a coating location 14. The coating location 14 is downstream of a batch forming apparatus 10 and is at or directly upstream of a packaging apparatus 16, which receives and encloses the batches 12 in discrete packages. Preferably, the coating apparatus includes a continuous feeder 30 for generating a controlled feed of the coating material at a constant volume or weight per unit time and a divider arrangement 34 (Fig. 2) for dividing the coating material into charges. Alternative apparatus for dividing the coating material may comprise diverter (106, Fig.3) or diverter valve (144, Fig.4). A control processor 1 may be utilised to adjust the rate of feed of the coating material dependant on the rate of production of the batches 12. The coating apparatus preferably injects the charges of coating material at location 14 with an injector 40, 42, which may comprise a fluid-pressure device which may provide a gas stream to entrain particles of coating material. Preferably, the product is a snack food, such as crisps, and the coating material is a flowable flavouring composition, which may be solid or liquid.

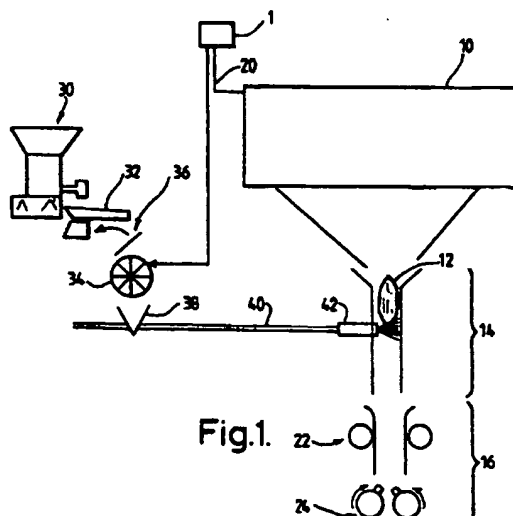
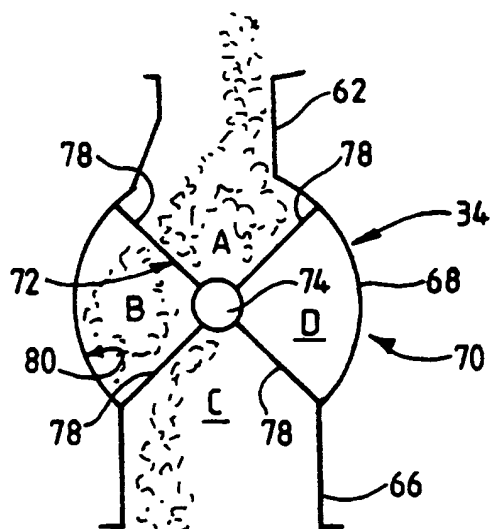
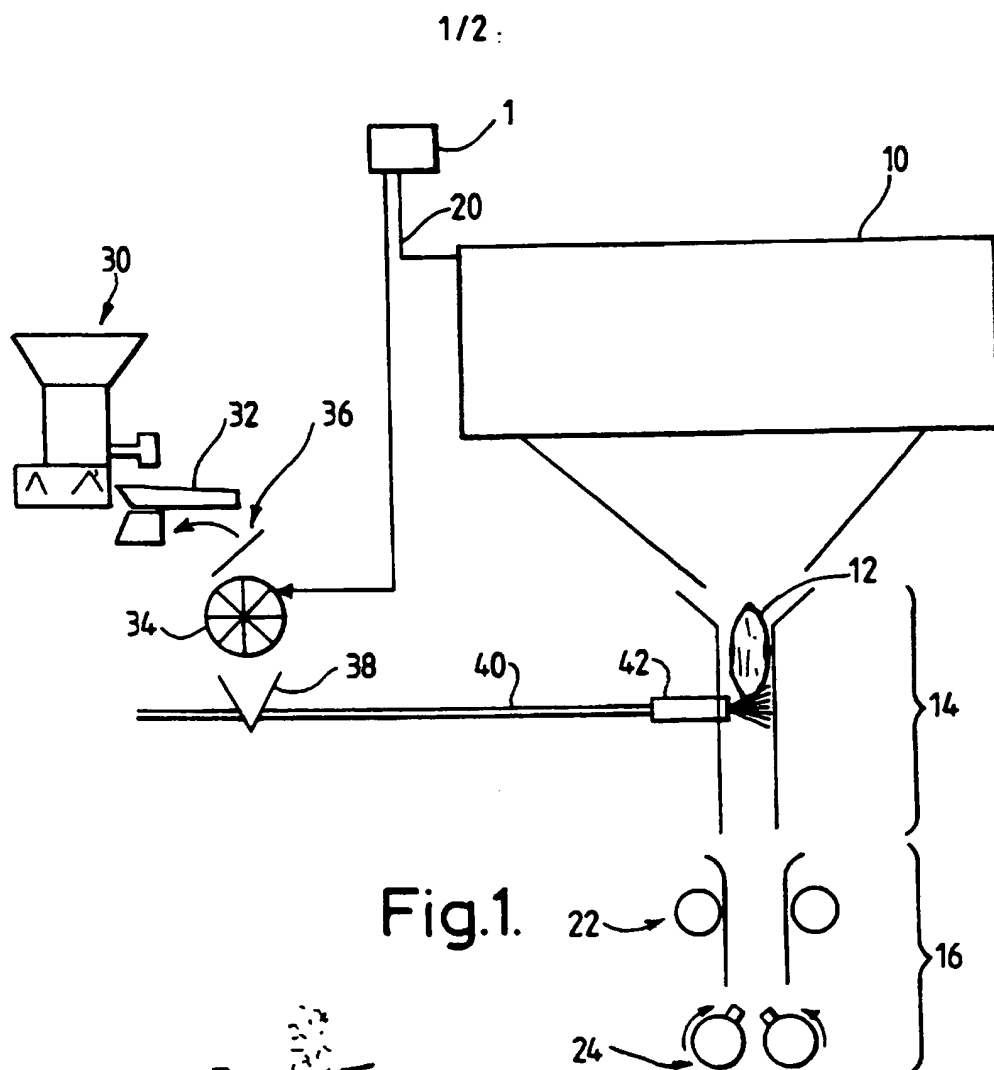


Fig.1.



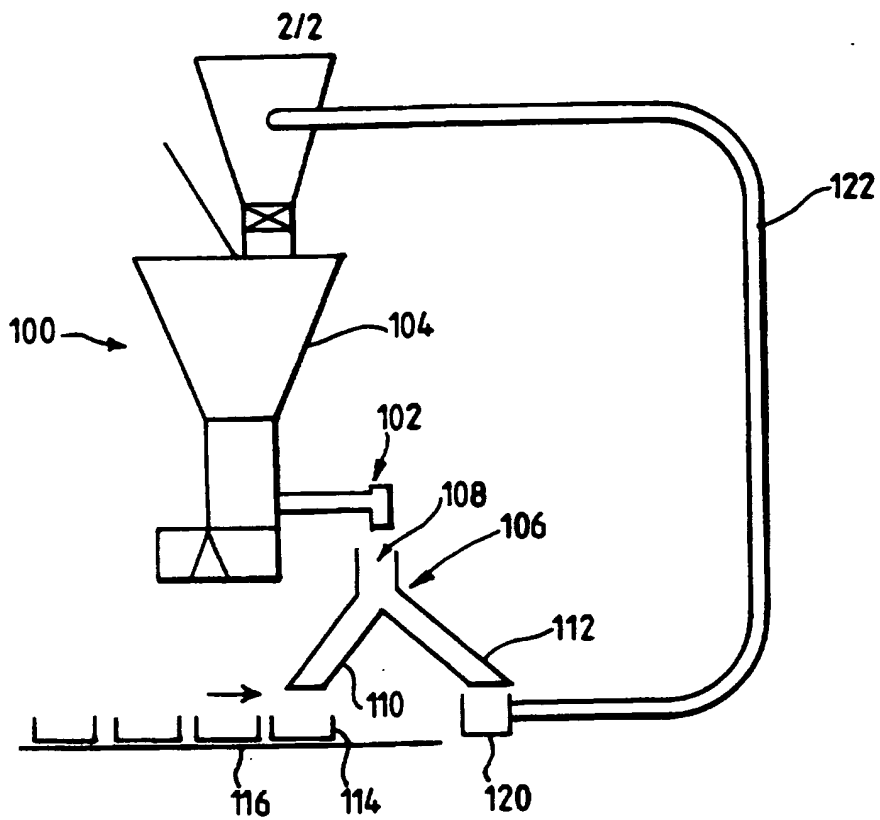


Fig.3.

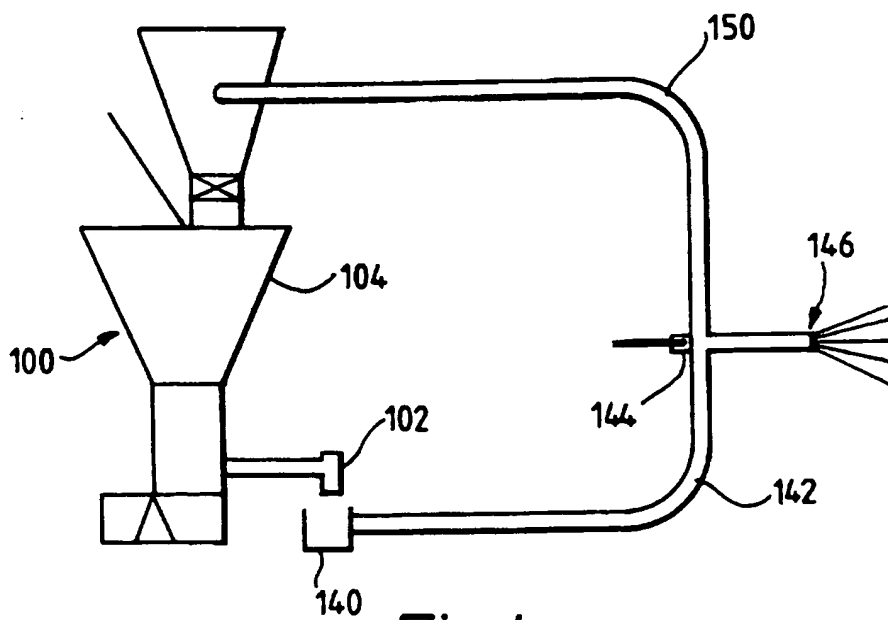


Fig.4.

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**METHODS AND APPARATUS FOR HANDLING AND TREATING PRODUCT**  
**ON A PRODUCTION LINE**

**FIELD OF THE INVENTION**

5       The present invention relates to materials  
handling and treatment apparatus. A preferred  
application of the invention is to application of  
flavouring compositions to foods, particularly  
particulate foods or snack foods e.g. potato crisps.

10

**BACKGROUND**

Potato crisps, like other snack foods, are  
typically coated with a flavouring composition. The  
flavouring composition may be salt, or other more  
15   complex flavouring compounds. Whatever flavouring is to  
be used, there is a need to control the amount of  
flavouring composition which is applied to ensure that  
the strength of flavour on the finished product is  
within acceptable limits.

20

Conventionally, potato crisps are made in large  
batches. The batches are each weighed, and then tumbled  
in a processing drum with an amount of flavouring  
composition appropriate to the weight of the batch. The  
25   intention is that tumbling will cause the flavouring  
composition to be coated evenly onto the crisps.

30

Subsequently, the coated crisps are weighed into  
small batches and packaged as a product for sale.

This system has disadvantages. First, there is a  
tendency for some of the flavouring composition to fall  
from the crisps before they are packaged. This results  
in wastage, because an extra quantity of flavouring  
35   composition must be added to the processing drum to

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compensate for this loss. This also causes a variation in the flavour of the final product. Also, apparatus which processes the crisps following coating will become contaminated with the flavouring composition.

5 This is particularly problematic when the flavouring composition is to be changed because such apparatus must be thoroughly cleaned to avoid contamination of the new flavouring composition with the old.

10 SUMMARY OF THE INVENTION

It is an aim of the present invention to ameliorate these problems and analogous problems which occurs when processing other coated products.

15 We disclose herein apparatus and methods for applying coating material such as a powdered flavouring to batched product such as a snackfood consisting of loose, discrete articles, which is to be packaged. The coating material is presented as charges of controlled  
20 size by dividing a uniform feed, e.g. from a weigher by means of a rotary valve. An injector or other suitable applicator applies the charges of coating material successively to respective batches of product, in-line downstream of the batch formation apparatus which is  
25 e.g. a multihead or linear weigher, and directly upstream of or at packaging apparatus such as a bagging machine. This minimises contamination by the coating material. A control unit may synchronise the applications with the production of the batches and  
30 control the coating material supply.

Particular aspects of the invention are set out in the claims.

35 According to one aspect herein there is provided material handling and processing apparatus for multiple articles comprising batch formation apparatus for

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receiving articles in bulk and for producing relatively smaller batches of articles, a coating apparatus for applying a coating material to articles, and a packaging apparatus for packaging a batch of articles into a discrete package; the apparatus being arranged such that the coating apparatus operates on individual batches of articles produced by the batch formation apparatus, before packaging of the batch by the packaging apparatus.

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This arrangement of apparatus ensures that the batch formation apparatus cannot become contaminated by the coating material. This is of particular advantage because the batch formation apparatus is commonly a component which presents particular difficulties when cleaning is required.

15

Articles processed by apparatus embodying the invention may be discrete articles such as potato crisps or other snack foods. Alternatively, it can be used to process articles in the form of particulate, granular or powdered material in applications where there is a requirement to coat a product with a coating composition.

25

The batch formation apparatus may operate on the basis of generating batches of constant weight or of constant volume. As an example, apparatus as described in UK Patent Specification No. 2127158 may be used. A loss-in-weight feeder, a batch weigher or a multi-head weigher could alternatively to provide batches of known weight. It will be recognised by those skilled in the art that many other types of weight-based or volumetric batch production apparatus could be used, as appropriate for the particular application of the apparatus.

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The invention may use batch or charge formation apparatus comprising a continuous feeder for generating a flow of material from a reservoir at a constant weight or a constant volume per unit time, a diverter  
5 for generating a batch by diverting that flow to an output for a predetermined time, and a recovery system for returning to the reservoir any material not diverted to the output. This apparatus has the advantage of being able to produce a batch of material  
10 of known weight or volume, as the case may be, on demand. No difficulty is encountered in the event that a demand for batches of material temporarily ceases.

The coating apparatus is most preferably arranged  
15 to minimise the distance travelled by the articles following coating and before packaging. This minimises the opportunity for coating composition to be lost from the articles.

20 In particularly advantageous embodiments, particularly suitable for use with coating material in powder form, the coating apparatus comprises a coating chamber within which can be created an "atmosphere" of coating composition, the articles becoming coated with  
25 the coating composition as they fall through the chamber. An electrostatic charge may be applied to the coating material and/or to the articles to reduce the tendency for them to separate.

30 The coating composition may be introduced into the coating chamber by an injector. Such an injector may carry the coating composition entrained in a fluid stream, especially a gas such as air.

35 It has been found preferable to introduce coating composition into the coating apparatus in synchronism

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with operation of the batch production apparatus. This can ensure that the articles and the coating composition arrive at the coating apparatus with a relative timing to ensure proper coating of the articles.

Measures may be taken during operation of apparatus embodying the invention to ensure that the batch production apparatus does not deliver batches of articles when either the coating apparatus or the packaging apparatus is not ready to receive them. If this were to happen then articles might potentially accumulate within the apparatus, or be mishandled, with generally undesirable consequences.

The coating apparatus preferably generates controlled size charges by means of a divider arrangement acting on a uniform feed e.g. from a weighing feeder. The divider arrangement may have an interrupter construction traversing the material path and having relatively movable parts with respective openings, a drive being provided - stepped or continuous - controllable to bring the respective openings into register with one another (allowing or causing onward flow of a charge of material) at a controlled frequency.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described in detail, by way of example, and with reference to the accompanying drawings in which:

Figure 1 is a schematic diagram of apparatus for batch weighing, flavouring and packaging potato crisps;

Figure 2 shows in more detail a diagrammatic cross-section of a depositor valve being part of the embodiment of Figure 1; and



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Figures 3 and 4 are schematic diagrams of apparatus for batch weighing, flavouring and packaging potato crisps being second and third embodiments of the invention.

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#### DESCRIPTION OF PREFERRED EMBODIMENTS

With reference to Figure 1, apparatus embodying the invention includes a batch formation apparatus comprising a multihead weigher 10. The multihead  
10 weigher 10 is conventional and widely used in production of potato crisps and of many other articles and will therefore not be described further, other than to say that it has a control input 20 upon which a signal can be placed in order to instruct the weigher  
15 to measure and release a batch of potato crisps (shown generally at 12) of a predetermined weight. This signal can be initiated from other apparatus, such as a packaging apparatus or a control unit.

20 The batches 12 which are produced by the multihead weigher fall from it, through a coating chamber at 14, into a packaging apparatus at 16. The packaging apparatus 16 comprises a tube 22 in which bags are formed and a sealing arrangement 24; again both of  
25 these are entirely conventional. The multihead weigher 10, the coating chamber 14, and the packaging apparatus 16 are all arranged in a vertical alignment. This arrangement allows batches 12 to drop through the apparatus, so avoiding the need to provide complex  
30 handling equipment to transport them. However, if it is deemed necessary or desirable, offsets can be accommodated between components by providing suitable conveyors.

35 The coating chamber 14 forms part of coating apparatus of this embodiment of the invention, which

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coating apparatus will now be described in greater detail.

5 The coating apparatus operates to deliver into the  
coating chamber 14 an amount of flavouring to be coated  
onto a batch of crisps 12. The flavouring is in the  
form of a fine powder. In the coating apparatus, a  
loss-in-weight feeder 30 generates a continuous supply  
10 of flavouring at a constant weight per unit time. The  
supply of flavouring is carried by a conveyer 32 to be  
deposited into a depositor valve 34. The depositor  
valve 34 operates to transform the continuous feed  
produced by the loss-in-weight feeder 30 into a regular  
succession of batches of flavouring. Each batch is  
15 collected from the output of the loss-in-weight feeder  
30 during a fixed time period, with the consequence  
that the batches are of substantially uniform weight,  
in a manner substantially as described in GB-A-2127158,  
which is hereby incorporated by reference.

20

A deflector valve 36 is positioned between the  
loss-in-weight feeder 30 and the depositor valve 34.  
The deflector valve 36 can be selectively operated to  
allow flavouring to enter the depositor valve 34, or to  
25 be diverted from it into a collection vessel (not  
shown). The intention behind this will become apparent  
in due course.

Batches of flavouring leaving the depositor valve  
30 34 are received by an input hopper 38 of a blowing line  
eductor. The eductor causes the flavouring to be  
carried from the hopper rapidly along a pipe 40 to an  
injector 42. From the injector 42, the flavouring is  
injected directly into the coating chamber 14.

35

With reference now to Figure 2, the depositor

valve 34 comprises a housing 70 having an upwardly open inlet port 62 and a downwardly open outlet port 66. The housing has a cylindrical valve chamber 68, having a horizontal axis. The inlet and the outlet ports  
5 62, 66 extend from the valve chamber 68. Within the valve chamber, there is a rotor 72 having a shaft 74 extending coaxially of the chamber 68 and being rotatable within it. A plurality of vanes 78 extend from the shaft 74, spaced at equal angles around it.  
10 The vanes 78 extend to approach closely an inner wall 80 of the chamber 68. Cells A to D are defined between adjacent vanes and the inner wall 80.

Externally of the housing 70, the shaft 74 is  
15 connected to a stepper motor by means of which it can be rotated. Suitable seals are provided where the shaft passes out of the housing 70.

As shown in Figure 2, cell A is open to the inlet  
20 port 62 and is being filled, at a constant mass-flow rate, by a flow of flavouring powder from the conveyer 32. Cell B is filled with flavouring awaiting release. The contents of cell C are being deposited into the outlet port 66. Cell D is empty.

25 The weight of flavouring in cell A can be deduced from the amount of time for which it has been receiving flavouring from the inlet port 62. After such a time as is required to fill the cell with a desired weight,  
30 the rotor is rotated by the stepper motor through an angle identical to the angle between adjacent vanes 78, such that cell A moves to the position formerly occupied by cell B, and the other cells are moved likewise. This causes the contents of cell B to be  
35 deposited into the output port 66 in a batch. This process can be repeated indefinitely to produce a

succession of batches of flavouring powder of approximately equal weight.

5 It will be understood that the amount of time for which the uppermost cell is filled with flavouring powder is fixed by the requirement for it to contain an amount of powder of a known weight. Under normal operation, this period is fixed by periodic rotation of the rotor 72. From time to time, it may happen that 10 the multihead weigher 10 is unable to deliver a batch of crisps 12, or that the packaging apparatus 16 is not ready to receive a batch of crisps 12 by the time that the uppermost cell has been filled with the required amount of flavouring. If this happens, the rotor 72 is 15 preferably not advanced because it would deposit a batch of flavouring that cannot be put to use. In this event, the deflector valve 36 is operated to prevent overfilling of the uppermost cell. Once the multihead weigher 10 or the packaging apparatus 16 is ready to 20 deliver or receive a batch of crisps, the rotor 72 can be rotated and the deflector valve 36 can be deactivated to allow normal operation to recommence. Flavouring powder which has been diverted to the collection vessel can be returned to the loss-in-weight 25 feeder 30.

A control unit 1 is provided which is programmed to control operation of the apparatus. Most particularly, the control unit 1 can (a) initiate 30 release of a batch of crisps 10 from the multihead weigher by placing a suitable signal on its control input 20; (b) initiate release of a batch of flavouring powder by activating the stepper motor in order to rotate the rotor 72; and (c) activate and deactivate 35 the deflector valve 36 as appropriate.

In operation, the control unit 1 is set by an operator to specify the amount of additive (in this case, flavouring powder) to be added to each batch of product (in this example, crisps) to be dropped into each bag. Additionally, the operator sets a default bag filling rate which should preferably be achieved. From these two figures, the control unit can calculate the rate of operation of the loss-in-weight feeder 30.

For example, the operator could specify that 2g of additive should be added to each batch with a default bag-filling rate of 60 bags per minute. Thus, the loss-in-weight feeder should achieve 120 g/minute (7.20 kg/hour).

During operation of the apparatus, the control unit 1 monitors (e.g. via conventional sensors) the frequency at which batches are actually being generated. If this frequency deviates from that expected, the control unit re-calculates the rate at which the loss-in-weight feeder should operate and adjusts its operation accordingly. In the above example, if the rate were observed to be 70 per minute, the control unit would re-calculate the required flow to be 140 g/min. The control unit is configured such that time elapsing during operation of the diverter valve is not taken into account when calculating a flow rate, since such diversions are normally temporary, and should not be allowed to effect a long-term influence on the calculated flow rate.

The control unit 1 can also be programmed to raise alarms in the event that the flow rate exceeds or falls below threshold levels, or in the event that the total amount of product or additive dispensed is such that a refill of additional product or additive is likely to

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be needed.

With reference now to Figure 3, an alternative batch formation apparatus is shown. This apparatus is  
5 suitable for use within the first aspect of the invention, to deliver batches of flavouring, and in many other applications.

The apparatus comprises a constant rate feeder 100  
10 which delivers material at a constant rate to an output 102. The rate may be constant in volume or constant in weight, as appropriate to a particular application. The feeder comprises a hopper 104 as a reservoir for the material.

15 Material is delivered from the output 102 to an intake 108 of a diverter 106. The diverter 106 delivers material received on its input 108 to one of two outputs 110 or 112. An electrical control signal  
20 is applied to the diverter 106 to determine which of the two outputs 110, 112 receives the material e.g. by means of a pivotable vane or sliding gate.

Material delivered to a first of the two outputs  
25 110 is deposited in a receptacle 114 at a delivery point for subsequent processing. A continuous supply of such receptacles 114 may proceed along a conveyer 116. Sensors are provided to indicate to a control unit the presence of a receptacle 114 at the delivery  
30 point, whereupon the control unit operates the diverter 106 to deliver material to the first output 110 for a predetermined time, and after that time has elapsed, to revert delivery to the second output 112. Given that the rate at which material is delivered to the diverter  
35 is known, the amount of material delivered to the receptacle is determined by the amount of time that the

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diverter 106 delivers material to its first output 110.

Material delivered to the second output 112 of the diverter 106 is received by a fixed receptacle 120 from  
5 which it is carried back to the hopper 104. In this embodiment, this is achieved by an air conveyor 122, but many other conveying systems (mechanical or otherwise) could be used. Thus, material delivered by the feeder 100 is either delivered as a batch to an  
10 output for use, or is eventually returned to the feeder 100. This allows batches to be generated on demand with no waste of material, nor is there a need to ensure that the demand for batches is regular and periodic.

15

The embodiment of Figure 4 operates in accordance with the same general principles of that of Figure 3. In this embodiment, the feeder 100 delivers material into an input 140 of an air conveyor 142. The air  
20 conveyor 142 has a diverter valve 144 which has two outputs. A first of the outputs delivers material to an injector nozzle 146 which injects the material into a coating chamber for application to a product. A second of its outputs delivers material to a return  
25 line 150 which feeds the material back to the hopper 104 of the feeder 100. By operating the valve 144 to deliver material to the first output for a predetermined time, a batch of material of known weight or volume is delivered to the nozzle 146.

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It will be clear that the nozzle is not an essential feature of the embodiment of Figure 4. The material might be delivered to any other receiving  
apparatus.

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For example, suppose that batches of 2g of

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material are required at a rate of 60 per minute, and that at least half a second must elapse between delivery of batches. A theoretical limit would be for the feeder to operate at a rate of 240 g/min (4 g/s) with batches being generated by diverting flow from the feeder for periods of half a second.

5



CLAIMS:

1. Handling and processing apparatus comprising  
batch formation apparatus (10) to receive a bulk  
5 supply of product and divide it into relatively smaller  
batches (12) of predetermined size for packaging;  
coating apparatus (30-42) adapted to divide a  
coating material into charges of predetermined size and  
apply the charges of coating material to respective  
10 said product batches (12) downstream of the batch  
formation apparatus (10), and  
packaging apparatus (16) which receives and  
encloses the product batches (12) in discrete packages;  
the coating apparatus (30-42) being disposed to  
15 apply said coating material at a coating location (14)  
which is at or directly upstream of the packaging  
apparatus (16).
2. Apparatus according to claim 1 in which the batch  
20 formation apparatus (10) comprises a weigher for  
controlling batch size by weight.
3. Apparatus according to claim 2 in which the batch  
formation apparatus (10) comprises a multi-head or  
25 linear weigher.
4. Apparatus according to any one of the preceding  
claims in which the packaging apparatus (16) is a  
bagging machine.  
30
5. Apparatus according to any one of the preceding  
claims in which the coating location (14) is on a  
product batch conveyor path leading directly to receipt  
of the product batches (12) in their packages.  
35
6. Apparatus according to claim 5 in which said

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conveyor path is an enclosed chute into which the coating apparatus injects the successive charges of coating material.

- 5     7.     Apparatus according to claim 5 or 6 in which product batches pass under gravity along said batch conveyor path past the coating location (14).
- 10     8.     Apparatus according to any one of the preceding claims in which a control processor (1) is programmed to synchronise said operation of the coating apparatus to apply coating material with passage of batches (12) from the batch formation apparatus (10).
- 15     9.     Coating apparatus for use in handling and processing apparatus according to any one of claims 1 to 8, comprising a divider arrangement (34) for dividing a controlled feed of coating material into said charges and an applicator (38,40,42) for  
20     transferring the charges successively onto the product batches (12).
- 25     10.    Apparatus according to any one of claims 1 to 8 in which the coating apparatus is as defined in claim 9 and in which the applicator is an injector (40,42) arranged to inject the charges of coating material at the coating location (14).
- 30     11.    Apparatus according to claim 9 or 10 in which the applicator comprises a fluid-pressure device for injecting the coating material at the coating location (14).
- 35     12.    Apparatus according to claim 11 in which the applicator provides a gas stream to entrain particles of coating material.

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13. Apparatus according to any one of the preceding claims, the coating apparatus including a continuous feeder (30) for generating a controlled feed of the coating material at a constant volume or constant weight per unit time.
14. Apparatus according to any one of the preceding claims in which a control processor (1) is programmed to adjust a rate of feed of the coating material in dependence on variations in rate of production of said batches (12).
15. Apparatus according to any one of the preceding claims comprising a diverter arrangement (36,106) which is switchable from a control processor (1) to interrupt the feed of coating material.
16. A method comprising the operation of apparatus according to any one of claims 1 to 15 to apply coating material to batches of product
17. A method according to claim 16 in which the product is a food.
18. A method according to claim 16 or 17 in which the product is loose discrete articles, and each batch (12) contains multiple articles.
19. A method according to any one of claims 16 to 18 in which the coating material is a flowable material, preferably either liquid or powder.
20. Handling and processing apparatus, coating apparatus or a method substantially as described herein with reference to Fig 1 of the drawings, or Fig 1 as modified in accordance with Fig 3 or Fig 4.



The  
Patent  
Office



INVESTOR IN PEOPLE

Application No: GB 9911120.5  
Claims searched: 1-20

Examiner: Dr Paul D Jenkins  
Date of search: 5 August 1999

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): A2B (BKX, BMS1, BMS5)

Int Cl (Ed.6): A21C 9/04; A23B 4/10; A23L 1/217; A23P 1/08

Other: Online: EPODOC, JAPIO, WPI

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2170091 A (NISSIN) see especially example 2, page 2, lines 37-38 and page 4, lines 50-52	1,16-19
Y	EP 0832695 A2 (ITW) see especially col.1, lines 15-41	11,12
Y	WO 93/02573 A1 (CLARK) see especially Fig.3 and page 8, lines 6-18	4
X,Y	US 5721000 (CENTER) see especially claims, Fig.2, col.3, lines 40-53, col.3, line 61 to col.4, line 17 and col.7, lines 8-18	X:1-3,5-10,13,16-19 Y:4,11,12

X Document indicating lack of novelty or inventive step  
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E Patent document published on or after, but with priority date earlier than, the filing date of this application.